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# *Gloiocephala cerkezii*, a new species from Croatia

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***Abstract:*** A new species, *Gloiocephala cerkezii*, is described from Croatia. It is characterized by a pale brown to rusty brown pileus, an elongated central to slightly eccentric stipe, vein-like lamellae, large and elongate spores, subcapitate to capitate cystidia, a gelatinized trama, and the absence of hairs on the pileus and stipe. The description is accompanied by black and white photograph of basidiocarps and line drawings of microscopic elements. *G. cerkezii* is compared to closely related species, and a dichotomous key to European species of the genus *Gloiocephala* is provided. A new combination *Gloiocephala pseudocaricis* is made.

***Key words:*** Agaricales, Basidiomycota, dichotomous key, taxonomy

## INTRODUCTION

Ten y ago we started an intensive research of Croatian mycobiota. Initially we made a survey of all species of the order *Agaricales* s.l. recorded for Croatia until 1999 (Mešić and Tkalčec 2002, Tkalčec and Mešić 2002, Mešić and Tkalčec 2003, Tkalčec and Mešić 2003a, b). No species of *Gloiocephala* Massee were originally recorded. Subsequently we continued with a fieldwork which resulted in the discovery of many species new to Croatia, as well as a few species new to science. So far we have found four species of *Gloiocephala* in Croatia, *G. caricis* (P. Karst.) Bas, *G. cornelii* (Laessøe et Noordel.) E. Horak and *G. menieri* (Boud.) Singer, as well as a new species, *G. cerkezii*, that we describe in this paper.

Significant contributions to knowledge on the genus *Gloiocephala* was made by Singer (1960, 1976, 1986, 1989). In addition several new species of *Gloiocephala* have been described (e.g. Noordeloos 1987, Horak and Desjardin 1994, Desjardin et al 1995, Desjardin and Horak 1997, Manimohan and Thomas 1998, Antonín 2003). On the basis of its large spores and absence of long hairs *G. cerkezii* would be classified in section *Gloiocephala*, subsection *Macrosporae*, according to Singer's (1986) classification. Some authors have treated *Gloiocephala* as a section or subgenus of the genus *Marasmius* (e.g. Antonín and Noordeloos 1993, Noordeloos 1995, Corner 1996, Bon 1999). Recent molecular analyses on the phylogeny of the Agaricales places *Gloiocephala*, including its type species *G. epiphylla* Massee and *G. menieri* (Boud.) Singer, in the Physalacriaceae (Moncalvo et al 2002, Binder et al 2006, Matheny et al 2007). In these same analyses the type of *Marasmius* occurs in a separate family, the Marasmiaceae. Hence we choose to describe our new species in *Gloiocephala*, but this issue requires further research.

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## MATERIALS AND METHODS

Our description of *Gloiocephala cerkezii* is based on nine collections and 105 basidiocarps collected on two localities in northwestern Croatia. All collected material and data are deposited in CNF (Croatian National Fungarium, Zagreb). Basidiocarps were preserved by drying. Microscopic features were observed by a light microscope (bright field) with magnification <1500×. All drawings were made with the help of a drawing tube. Description of macroscopic characters were based on observations of fresh basidiocarps, whereas description and illustrations of microscopic characters were based on rehydrated dried specimens mounted in 5% potassium hydroxide (KOH). Some hyaline elements were observed in Congo red (1% water solution) after pretreatment in 5% KOH. From each collection one mature basidiocarp was chosen and 30 randomly selected spores were measured (including the apiculus). Spore measurements (length, width) are given as: (min.) stat. min. – av. – stat. max. (max), where ''min.'' = minimum (lowest measured value), ''stat. min.'' = statistical minimum (arithmetic average minus two times standard deviation), ''av.'' = arithmetic average, ''stat. max.'' = statistical maximum (arithmetic average plus two times standard deviation), ''max.'' = maximum (highest measured value). The range of arithmetic averages (av.) of spore measurements of each particular collection also is given. Standard deviation (SD) of spore length and width is given as: min. – av. – max. The length/width ratio of spores is given as the ''Q'' value (min. – av. – max.), and range of arithmetic averages of ''Q'' value (Q av.) of each particular collection also is given.

## RESULTS

**Gloiocephala cerkezii** Tkalčec et Mešić, sp. nov.
FIGS. 1–2

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*Etymology.* Dedicated to Mr Milan Čerkez in recog-

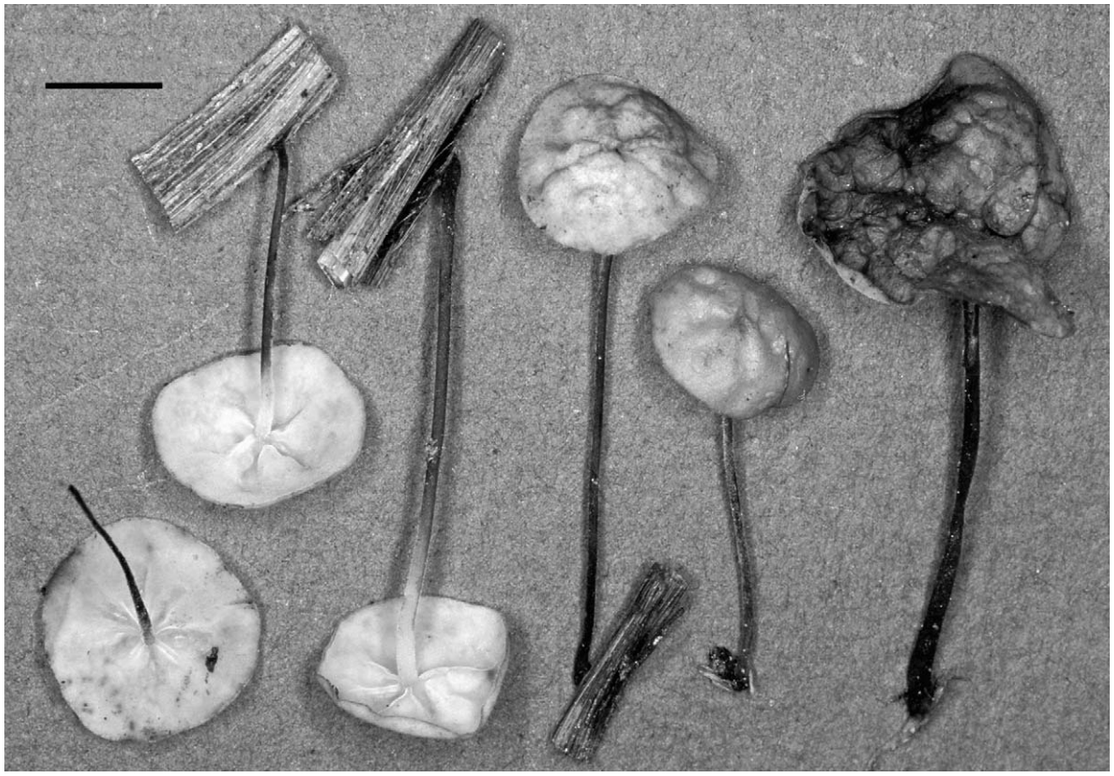

FIG. 1. Basidiocarps of *Gloiocephala cerkezii* (holotype). Bar = 5 mm.

nition of his great fieldwork contributions to the knowledge of the Croatian mycobiota.

Pileus (3–)5–13(–19) mm latus, convexus, plano-convexus, applanatus vel plano-concavus, rugosus, saepe venosus, opacus, siccus, minute granulato-pubescens sub lente, non hygrophanus, pallide brunneus (raro cremeus) vel ferrugineo brunneus. Lamellae veniformes, irregulares, adnatae vel subdecurrentes, valde distantes, saepe furcatae et intervenosae, rarissime marginem pilei attingentes, hymenium inter lamellis ± rugosum, albicans vel dilute ochraceum, maculis ferrugineis saepe notatum. Stipes (9–)11–25 × 0.2–1 mm, centralis vel excentricus, cylindricus, basi saepe ± dilatata, insiticius vel subinsiticius, pubescens, siccus, apice plerumque albicans, inferne brunneus, deinde atrofuscus vel niger. Contextus tenuissimus. Odor nullus. Depositum sporarum album.

Sporae 10.5–14.4–21.0 × 3.1–4.0–5.2 µm, Q = 2.4–3.6–5.3, anguste fusiformes vel anguste clavatae, hyalinae, tenuitunicatae, non amyloideae. Basidia 27–51 × 5–9 µm, plerumque tetrasporigera. Cystidia hymenialia difformia: alia forma pileocystidiis similis, altera hyphoidea 23–50 × 2–5 µm. Trama pilealis et hymenophoralis irregularis, gelatinosa, hyphae 1–6 µm latae, tenuitunicatae. Pileipellis hymeniformis, elementa heteromorpha, 10–43 × 3–24 µm, hyalina vel brunnea, tenuitunicata vel crassitunicata (ad 3 µm), pigmentum parietale. Pileocystidia 37–85 × 5.5–13 µm, apice 4.5–13 µm, anguste utriformia, lageniformia, fusiformia, anguste clavata vel subcylindrica, plerumque subcapitata vel capitata, hyalina vel brunnea, plerumque tenuitunicata, abundantia. Stipitipellis cutis est, hyphae 1.5–6 µm latae, brunneae. Caulocystidia 21–75 × 6–17 µm, apice 4–10.5 µm, pileocystidiis similia, in basi saepe forte dilatata, hyalina vel brunnea obscura, tenuitunicata vel crassitunicata (ad 2.5 µm). Fibulae abundantes.

In pratis humidis in partibus emortuis speciei *Carex hirta* et in pomariis derelictis in ramulis radicum emortuis speciei *Prunus domestica*. Aestate–autumno.

HOLOTYPUS: CROATIA, Zagreb, Sisak, Dužica, 45°31′54″N, 16°12′35″E, 110 m s. m., in pratis humidis, in partibus emortuis speciei *Carex hirta*, 21 Sep 2002, leg. *M. Čerkez*, in CNF fungario conservatus (1/2768).

*Pileus* (3–)5–13(–19) mm broad, convex, plano-convex, applanate or plano-concave, often with an irregularly warped edge (down or up), wrinkled, often venose, mat, dry, finely granular-pubescent under hand lens, sometimes with minute dark brown dots (resinous exudates), not hygrophanous, pale brown (rarely cream) to rusty brown, more or less irregularly pigmented. *Lamellae* vein-like, irregular, adnate to subdecurrent, distant, L = (4–)5–7(–8), l = 0(–1), often furcate or intervenose, very rarely reaching the margin of pileus, often not exceeding half the radius, hymenial surface between the lamellae often more or less wrinkled, hymenium

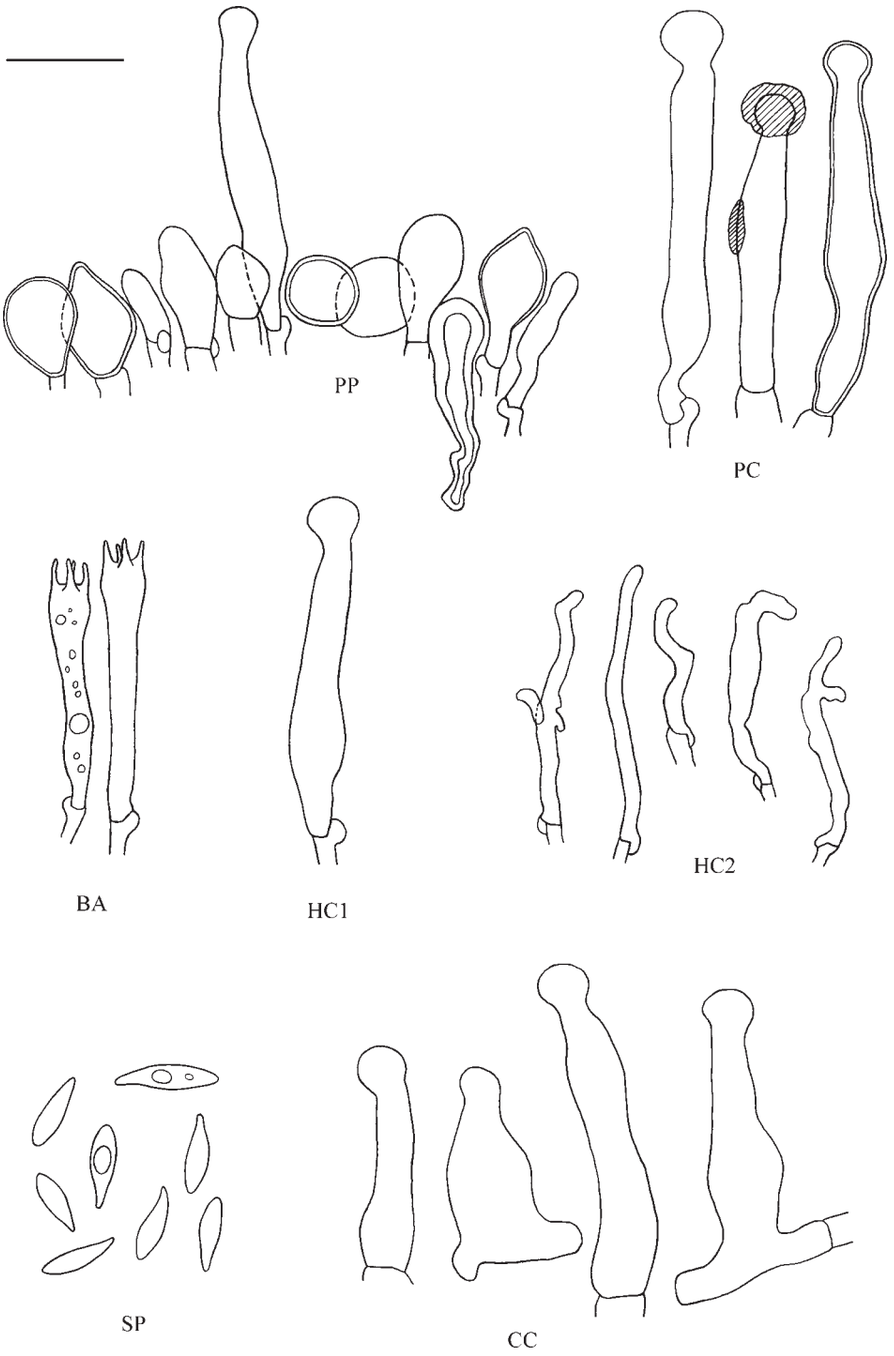


FIG. 2. *Gloiocephala cerkezii*. PP. Pileipellis. PC. Pileocystidia. BA. Basidia. HC1. Hymenial cystidia type 1. HC2. Hymenial cystidia type 2. SP. Spores. CC. Caulocystidia. All microscopic elements are drawn from the holotype, except for HC2 that is drawn from CNF 1/3482. Bar = 20 μm.

whitish to pale ochraceous, often with rusty brown dots or stains. *Stipe* (9–)11–25 × 0.2–1 mm, central or slightly eccentric, cylindrical, often more or less broadened at the base, insititious to subinsititious, entirely pubescent, dry, usually whitish at apex (sometimes brown), downward brown, then black-brown to black (at least in the lower half). *Context* very thin. *Odor* absent. *Flavor* not observed. *Spore-print* white.

*Spores* (10.5–)10.6–14.4–18.1(–21.0) × (3.1–)3.3–4.0–4.7(–5.2) μm, av. 12.8–16.4 × 3.7–4.3 μm; SD = 1.17–1.88–2.03 × 0.21–0.36–0.46, Q = 2.4–3.6–5.3, Q

av. = 3.3–3.9, narrowly fusiform to narrowly clavate, hyaline, smooth, thin-walled, nonamyloid, nondextrinoid. *Basidia* 27–51 × 5–9 µm, 4-spored (rarely 1-, 2-, or 3-spored), narrowly clavate, hyaline, thin-walled, clamped. *Basidioles* narrowly clavate, less frequently subcylindrical, with an obtuse to moderately acute apex. *Hymenial cystidia* in two types: (i) one is similar to pileocystidia in size and shape, rare to almost absent (moderately abundant in only one collection); (ii) the other is hyphoid, subcylindrical to irregular, often with one or few short projections, hyaline, thin-walled, clamped, almost absent to moderately abundant, 23–50 × 2–5 µm. *Pileal* and *hymenophoral trama* irregular, gelatinized, made up of 1–6 µm wide, branched, often twisted and/or shrivelled, hyaline, thin-walled, clamped hyphae. *Pileipellis* hymeniform, made up of variously shaped elements, clavate, utriform, subglobose, ovoid, sphaeropedunculate, ellipsoid, conical, fusiform, subcylindrical, 10–43 × 3–24 µm, apex sometimes more or less mucronate, hyaline, yellow-brown to dark rusty-brown, thin- to thick-walled (<2[–3] µm), clamped, pigment parietal. *Pileocystidia* 37–85 × 5.5–13 µm, apex 4.5–13 µm, narrowly utriform, lageniform, fusiform, narrowly clavate or subcylindrical, almost always subcapitate to capitate, hyaline (more frequently) to yellow-brown, sometimes with yellow-brown to dark rusty-brown resinous exudates, mostly on apex, thin-walled, less frequently thick-walled (<1.5 µm), abundant (rarely sparse), more frequent near margin of pileus, clamped. *Stipitipellis* a cutis, made up of 1.5–6 µm wide, brown, thin- to slightly thick-walled (<1 µm), clamped hyphae, with dark brown secreted clots, abundant in lower part of stipe, rare to abundant in upper part. *Caulocystidia* 21–75 × 6–17 µm (without broadened base), apex 4–10.5 µm, subcylindrical, narrowly utriform, lageniform or fusiform, almost always with subcapitate apex, often with broadened base, hyaline to dark brown, sometimes with brown exudates, thin- to thick-walled (<2.5 µm), abundant to sparse, clamped. Clamps abundant in all tissues, large.

*Habitat*. The species has been found in two different habitats. One is a small, wet, neglected grassland beside a forest road (forest with *Quercus robur*, *Fraxinus angustifolia*, *Alnus glutinosa*), on dead parts of *Carex hirta* near ground (often when those are still attached to a living plant). The other habitat is a neglected orchard with young but withering or dead trees of *Prunus domestica*, accompanied with *Acer campestre*, *Cornus sanguinea*, *Corylus avellana*, *Juglans regia* and *Ligustrum vulgare*, on dead root twigs of *P. domestica* on the ground level.

*Phenology*. (Jul)Aug–Sep(Oct).

*Additional specimens examined*. CROATIA: 38 km SE of Zagreb, 2.2 km WSW of the Dužica village, 45°31′54″N, 16°12′35″E, alt. 110 m, wet grassland, on dead parts of *Carex hirta*, leg. *M. Čerkez*, 7 Sep 2002 (CNF 1/2754), 15 Sep 2002 (CNF 1/2765), 30 Aug 2003 (CNF 1/3095), 3 Oct 2003 (CNF 1/3149), 29 Aug 2004 (CNF 1/3482), 26 Aug 2006 (1/4038), 11 km NE of Zagreb, Jalševec village, 45°52′08″N, 16°04′09″E, alt. 210 m, neglected orchard, on dead root twigs of *Prunus domestica*, leg. *M. Čerkez*, 8 Sep 2002 (CNF 1/2761), 3 Jul 2003 (CNF 1/3081).

## DISCUSSION

*Gloiocephala cerkezii* is characterized by its pale brown to rusty brown pileus, elongated central to slightly eccentric stipe, vein-like lamellae, large and elongate spores, subcapitate to capitate cystidia, a gelatinized trama, and the absence of hairs on the pileus and stipe. In Europe the species closest to *G. cerkezii* is *G. menieri* that differs by short (<2 mm long), lateral or strongly eccentric stipe, and wider spores (5.5–7.5 µm). Among extra-European species the closest are *G. inobasis* Singer, *G. longisperma* Singer and *G. palmarum* Singer (Singer 1976). *G. inobasis* differs by pure white pileus, spathuloid basidiocarps, longer and wider hymenial and pileal cystidia, and non-gelatinized trama. *G. longisperma* differs by usually white, small pileus (<3 mm), lack of subcapitate and capitate cystidia, presence of hairs in pileipellis (<200 µm), and regular, nongelatinized trama. *G. palmarum* differs by usually orange pigmentation in pileus, lateral to sublateral stipe, longer and wider pileocystidia, and nongelatinized trama. *Gloiocephala cerkezii* is easy to recognize macroscopically among all European agarics, so it is obviously an exceptionally rare species.

### KEY TO ERUOPEAN SPECIES OF GENUS *GLOIOCEPHALA*

This key is based on the literature descriptions (Bas 1961, Noordeloos 1981, 1987, 1995, Antonín and Noordeloos 1993, Bon 1999, Horak 2005), as well as on our collections.

1. Stipe (9–)11–25 mm long, pileocystidia subcapitate to capitate . . . . . *G. cerkezii*
1. Stipe <6(–10) mm long, subcapitate to capitate pileocystidia absent, or when present, stipe <2.5 mm long . . . 2
   2. Lamellae vein-like and never reach the margin of the pileus; stipe stunted; pileus <15 mm wide *G. menieri*
   2. Lamellae pretty well developed and at least some reach the margin of the pileus, or hymenium smooth to wrinkled; stipe well developed; pileus <6 mm wide . . . . . 3
3. Hymenium smooth to wrinkled; basidiocarps usually spathuloid . . . . . *G. cornelii*
3. Hymenium lamellate; basidiocarps never spathuloid 4
   4. Basidia predominantly 2-spored; pileus white to whitish . . . . . *G. caricis*
   4. Basidia 4-spored; pileus pinkish-ochraceous . . . . *G. pseudocaricis* (Noordel.) Tkalčec et Mešić, *comb. nov.*

MYCOBANK MB 511241

Basionym: *Marasmius pseudocaricis* Noordel., Persoonia 11(3): 373, 1981.

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